

REMARKS

The Applicants hereby submit the present Amendment And Request For Reconsideration in response to the Office Action of 6 March 2006 for the above-referenced patent application, entry of which is earnestly solicited.

In the present Amendment, claims 1, 2, 8, 12, 13, 22, 23, 27, and 29 have been amended and claims 3-7, 9, 14-17, 20, 24-26, and 28 have been canceled. No new matter has been entered; most of the inserted limitations are drawn from dependent claims of the application which have been canceled.

In the Office Action of 6 March 2006, the Examiner objected to claims 26-28 due to some informalities. In response, as the Applicants have canceled claims 26-28, such objections no longer apply.

In the Office Action of 6 March 2006, the Examiner rejected claims of the application under 35 U.S.C. § 102 and 103 based on Pinarbasi (U.S. Patent No. 6,226,159) and additional references including Gill (U.S. Patent No. 6,356,419) and Gill (U.S. Patent No. 6,985,338). In response, the Applicant respectfully submit that the claims as amended are allowable over the prior art of record at least for the following reasons.

The prior art of record fails to adequately teach, suggest, or render obvious the present invention as defined by the claims. The claims are directed to a “self-pinned AP layer structure” which is pinned by its magnetostriction and air bearing surface (ABS) stress without the need for any antiferromagnetic (AFM) layer to be utilized for pinning, where the second AP self-pinned layer (i.e. the AP self-pinned layer that is closer in proximity to the free layer than the other AP self-pinned layer) comprises a cobalt layer and has no iron content and the first AP self-pinned layer comprises a cobalt-iron layer.

Also, there is no adequate suggestion or motivation to combine the teachings of the references as the Examiner suggestions.

For one, the Examiner states that the Pinarbasi reference teaches a “self-pinned AP layer structure.” The Examiner is incorrect. The Pinarbasi reference teaches an AP pinned layer structure that is pinned by an AFM pinning layer, not one that is “self-pinned” as understood by those ordinarily skilled in the art. Such an interpretation of the claims would be unreasonable.

Note that, in a self-pinned structure, adequate self-pinning properties must be achieved through magnetostriction and ABS stress. One ordinarily skilled in designing a *self-pinned structure* would be initially motivated to achieve adequate self-pinning properties of the sensor. Motivation of one ordinarily skilled for such a design is stated in the present application:

“...attempts have been made to increase the magnetostriction of the AP self-pinned layer structure to improve its self-pinning effect.... By proportionally increasing the iron content in cobalt-iron pinned layers, for example, the magnetostriction was shown to increase. For example, the magnetostriction increased by about a factor of two (2) using $\text{Co}_{60}\text{Fe}_{40}$ materials in the AP pinned layers.”

As apparent, one ordinarily skilled in designing a *self-pinned structure* would tend to utilize more iron content in the pinned layers – not, as the Examiner suggests, little or no iron.

Further, there must be a reasonable expectation of success to combine the references. In the design phase of a sensor having an AP self-pinned structure, one ordinarily skilled in art would naturally adhere to guiding principles of material usage at the present time. This is described in the present application:

“...it is generally true that proportionally increasing the iron content in cobalt-iron increases the magnetostriction in an AP self-pinned layer structure. For example, the magnetostriction increases by about a factor of two (2) with use of $\text{Co}_{60}\text{Fe}_{40}$ materials in the AP self-pinned layers.”

As apparent, one ordinarily skilled in the art would understand that “proportionally increasing the iron content in cobalt-iron increases the magnetostriction in an AP self-pinned layer structure”. Thus, one skilled in the art would not consider utilizing a pure cobalt material in an AP self-pinned layer structure as there exists no reasonable expectation of success for achieving adequate self-pinning properties.

Finally, the Applicants respectfully submit that “...objective evidence or secondary considerations such as unexpected results... are relevant to the issue of obviousness and must be considered in every case where in which they are present.” General expectations for the use of pinned layer materials are described in the present application:

“...it is generally true that proportionally increasing the iron content in cobalt-iron increases the magnetostriction in an AP self-pinned layer structure. For example, the magnetostriction increases by about a factor of two (2) with use of $\text{Co}_{60}\text{Fe}_{40}$ materials in the AP self-pinned layers.”

Unexpected results from use of the present invention are also described in the application:

“[h]owever, we have found that cobalt material in itself provides more positive magnetostriction than cobalt-iron in self-pinned applications. In fact, measurements show that the magnetostriction can be increased by 50% to almost a factor of three (3) with use of a cobalt film in a particular configuration... Furthermore, we have found that a more specific arrangement of cobalt film in the AP self-pinned layer structure provides an additional advantage. Specifically, the magnetoresistance coefficient $\Delta R/R$ of the sensor as well as the magnetostriction may be increased by utilizing cobalt (Co) in the second AP pinned layer and cobalt-iron (CoFe) in the first AP pinned layer.”

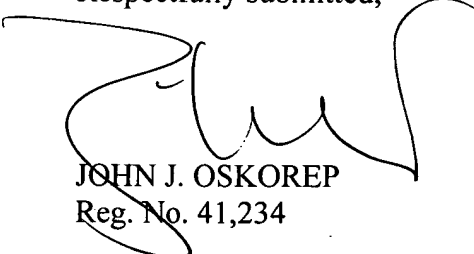
See also Tables 1 and 2 of the present application. Utilizing pure cobalt in an AP self-pinned layer structure has produced advantageous unexpected results.

Additional reasons for allowability of several dependent claims are not further described as these rejections are now moot.

The Applicants respectfully requests entry of the amendment and reconsideration of the claims as amended. Based on the above, the Applicant submit that all pending claims are allowable over the prior art of record and that the present application is now in a condition suitable for allowance.

Thank you. Please feel free to contact the undersigned if it would expedite the prosecution of the present application.

Respectfully submitted,



JOHN J. OSKOREP
Reg. No. 41,234

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JOHN J. OSKOREP, ESQ. LLC
ONE MAGNIFICENT MILE CENTER
980 N. MICHIGAN AVENUE, SUITE 1400
CHICAGO, ILLINOIS 60611 USA

Telephone: (312) 222-1860 Fax: (312) 475-1850